

**REMARKS**

Claims 1, 3-6, 8-11 and 14-23 are pending in the application with claims 1, 14 and 15 being the independent claims. Claims 1 and 15 are amended. Claims 16-23 are new. Support for these amendments and new claims may be found in the specification and drawings as originally filed.

**Rejections Under 35 U.S.C. § 112**

The Examiner rejected claim 1 under 35 U.S.C. § 112, second paragraph as containing a term without proper antecedent basis. Applicants have amended claim 1 to correct the antecedent basis. Accordingly, Applicants respectfully request that the Examiner withdraw this rejection.

**Rejections Under 35 U.S.C. § 103**

**Claims 1, 3-6 and 8-11**

The Examiner rejected claims 1, 3-6 and 8-11 under 35 U.S.C. § 103 as being unpatentable over JP 409251981A to Kurihara *et al.* (Kurihara) in view of U.S. Patent No. 6,086,677 to Umotoy *et al.* (Umotoy). Claim 1 now relates to a processing apparatus including a gas supply mechanism that supplies a processing gas into a processing chamber via a plurality of gas supply holes including a plurality of primary gas supply holes and a plurality of circulating gas supply holes. The processing apparatus also includes an evacuating mechanism that evacuates the processing gas from the processing chamber and a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from the processing chamber to the gas supply mechanism. The gas supply mechanism includes a primary gas supply system that supplies primary gas supplied from a processing gas source into the processing

chamber via the primary gas supply holes and a circulating gas supply system that supplies at least a portion of the exhaust gas into the processing chamber via the circulating gas supply holes. The primary gas supply system and the circulating gas supply system are constituted as systems independent of each other. The ratio of the number of the primary gas supply holes and the number of the circulating gas supply holes is set equal to the ratio of a target flow rate for the primary gas and a target flow rate for the circulating gas, the number of the circulating gas supply holes being greater than the number of the primary gas supply holes. The hole radius and the hole density of the primary gas supply holes are constant over an entire surface.

The combination of Kurihara and Umotoy do not teach or suggest all the features of the claimed invention. For example, Kurihara and Umotoy do not teach or suggest that the number of said circulating gas supply holes is greater than the number of said primary gas supply holes, as recited in claim 1.

Kurihara teaches a semiconductor manufacturing system that includes a chemical cylinder 111 which supplies process gas to a vacuum tube (sic) 101 through a nozzle. A turbo molecular pump 105 is connected to the vacuum tube 101, and a recycle line 107 extends between the exhaust side of the pump 105 and the vacuum tube 101. See Kurihara, paragraph 11. A nozzle, as shown in FIG. 5, includes an equal number of holes for gas flow from a recycle line 107 and gas flow of the process gas supply from the chemical cylinder 111. FIG. 5 shows the holes from the recycle line being located at one side of the nozzle and the holes from the process gas supply being located at the other side of the nozzle.

Umotoy teaches a dual gas faceplate for a showerhead in a semiconductor wafer processing system having a lower gas distribution plate 148 and an upper gas distribution plate 150. The two plates define distinct passageways for two process gases to enter a processing region 104. See Umotoy, column 4, line 65-column 5, line 2. The showerhead includes a portal region 200 having two sets of holes 204 and 206, where each hole has a center-to-center spacing approximately 6.35 mm from a neighboring hole. See Umotoy, column 5, lines 31-34. The holes 204 allow passage of the first gas and the holes 206 allow passage of the second gas. See Umotoy, column 5, lines 47-51.

However, neither Kurihara nor Umotoy teaches or suggests all the features of claim 1. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference(s) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). See MPEP § 2143.

Neither Kurihara nor Umotoy teaches or suggests a processing apparatus where "the number of said circulating gas supply holes is greater than the number of said primary gas supply holes." Instead, each reference shows the same number of holes for each processing gas. Accordingly, the references, either alone or in combination, do not teach or suggest all the features recited in claim 1.

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The Examiner stated with reference to claim 14 that "it would be obvious for one of ordinary skill to have a larger number of circulating holes so as not to make the circulating system conductance limited so as to enable a required flow of circulating gas without increasing the backflow." See Office Action, page 4. However, such an assertion does not render a claim unpatentable that recites that "the number of said circulating gas supply holes is greater than the number of said primary gas supply holes" because the cited references do not teach or suggest this feature, and as such, at least the third requirement of a *prima facie* case of obviousness is not present. In the absence of any prior art sufficient to show a *prima facie* case of obviousness, the claim should be allowed.

Further, claim 1 recites that "the ratio of the number of said primary gas supply holes and the number of said circulating gas supply holes is set equal to the ratio of a target flow rate for said primary gas and a target flow rate for said circulating gas." In the case that the number of gas supply holes is set equal to a target flow rate, the Examiner's asserted argument about backflow are rendered moot because the backpressure for each hole set would be substantially equal.

Neither Kurihara nor Umotoy teaches or suggests all the features of claim 1. Accordingly, claim 1 is patentable over this combination of references. Applicants respectfully request that the Examiner reconsider and withdraw this rejection.

Claims 3-6 and 8-11 depend from and add additional features to independent claim 1. Accordingly, these claims are patentable for at least the reasons set forth above with regard to claim 1. Applicants respectfully request that the Examiner reconsider and withdraw this rejection.

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### Claims 14 and 15

The Examiner rejected claims 14 and 15 under 35 U.S.C. § 103 as being unpatentable over Kurihara. Applicants traverse the rejection. Claim 14 relates to a processing apparatus including a gas supply mechanism that supplies a processing gas into a processing chamber. The processing gas is supplied via a plurality of gas supply holes including a plurality of primary gas supply holes and a plurality of circulating gas supply holes. The processing apparatus also includes an evacuating mechanism that evacuates the processing gas from the processing chamber and a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from the processing chamber to the gas supply mechanism. The gas supply mechanism includes a primary gas supply system that supplies primary gas supplied from a processing gas source into the processing chamber via the primary gas supply holes. The gas supply mechanism also includes a circulating gas supply system that supplies at least a portion of the exhaust gas into the processing chamber via the circulating gas supply holes with the primary gas supply system and the circulating gas supply system constituted as systems independent of each other. The number of the circulating gas supply holes is greater than the number of the primary gas supply holes.

Including more circulating gas holes than primary gas holes, as recited in claim 14, assists in supplying a higher flow of circulating gas while maintaining the same flow per unit area as the primary gas to give uniformity of processing. See Specification, page 5, lines 3-7. As set forth above, the Examiner stated that "it would be obvious for one of ordinary skill to have a larger number of circulating holes so as not to make the circulating system conductance limited so as to enable a required flow of circulating gas

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without increasing the backflow.” See Office Action, page 4. However, the Examiner’s assertion does not render claim 14 unpatentable, and the all the features of claim 14 are not taught or suggested in the cited reference. Kurihara fails to teach or suggest that “the number of said circulating gas supply holes is greater than the number of said primary gas supply holes,” as recited in claim 14. Because the Examiner has failed to provide a prior art reference that teaches or suggests all the claimed features, the Examiner has failed to set forth a *prima facie* case of obviousness. In the absence of a *prima facie* rejection, claim 14 is allowable over Kurihara.

The Examiner’s assertion regarding backflow may arguably relate to the presence of the first requirement of the *prima facie* case of obviousness, namely, a suggestion or motivation to modify the reference or to combine reference teachings. However, the assertion and the reference together, do not meet the third requirement, namely, the *prior art reference* must teach or suggest all the claim limitations. Because the Examiner has not shown a *prima facie* case of obviousness, Applicants respectfully request that the Examiner withdraw the rejection.

Claim 15 relates to a processing apparatus including a gas supply mechanism that supplies a processing gas into a processing chamber through primary gas supply holes and an evacuating mechanism that evacuates the processing gas from the processing chamber. The processing apparatus also includes a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from the processing chamber to the gas supply mechanism through circulating gas supply holes. The gas supply mechanism includes a primary gas supply system that supplies primary gas supplied from a processing gas source into the processing chamber and a circulating

gas supply system that supplies at least a portion of the exhaust gas into the processing chamber with the primary gas supply system and the circulating gas supply system constituted as systems independent of each other. The total hole area of the primary gas supply holes is less than the total hole area of the circulating gas supply holes.

The Examiner rejected claim 15 stating that the recitation of quantities of gas is an intended use. Applicants have amended claim 15 to structurally define over Kurihara. Kurihara fails to teach or suggest that "the total hole area of the primary gas supply holes is less than the total hole area of the circulating gas supply holes." A larger total hole area of circulating gas holes than primary gas holes allows the circulating gas to be supplied in greater quantities than the primary gas holes at substantially the same flow rate per unit area. The references cited fail to teach or suggest this feature. Applicants respectfully request that the Examiner pass claims 14 and 15 to allowance.

### **New Claims**

New claims 16-23 depend from and add additional features to independent claim 14. Accordingly, these claims are patentable for at least the reasons set forth above with regard to claim 14. Applicants respectfully request that the Examiner reconsider and withdraw this rejection.

### **Conclusion**

In view of the foregoing amendments and remarks, Applicants respectfully request that the Examiner reconsider and withdraw the outstanding rejections.

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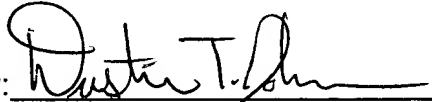
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Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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## APPENDIX

### VERSION WITH MARKINGS TO SHOW CHANGES MADE

#### **AMENDMENTS TO THE CLAIMS**

Claims 16-23 are new.

Claims 1 and 15 are amended as follows:

1. (Three Times Amended) A processing apparatus comprising:

a gas supply mechanism that supplies a processing gas into a processing chamber via a plurality of gas supply holes including a plurality of primary gas supply holes and a plurality of circulating gas supply holes,

an evacuating mechanism that evacuates the processing gas from said processing chamber, and

a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from said processing chamber to said gas supply mechanism,

wherein said gas supply mechanism includes,

a primary gas supply system that supplies primary gas supplied from a processing gas source into said processing chamber via said primary gas supply holes, and

a circulating gas supply system that supplies at least a portion of the exhaust gas into said processing chamber via said circulating gas supply holes with said primary gas supply system and said circulating gas supply system constituted as systems independent of each other, and

wherein the ratio of the number of said primary gas supply holes and the number of said circulating gas supply holes is set equal to the ratio of a target flow rate for said

primary gas and a target flow rate for said circulating gas, the number of said circulating gas supply holes being greater than the number of said primary gas supply holes, and wherein the hole radius and the hole density of said primary gas supply holes are constant over [the] an entire surface.

15. (Once Amended) A processing apparatus comprising:

a gas supply mechanism that supplies a processing gas into a processing chamber though primary gas supply holes;

an evacuating mechanism that evacuates the processing gas from said processing chamber, and

a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from said processing chamber to said gas supply mechanism through circulating gas supply holes,

wherein said gas supply mechanism includes,

a primary gas supply system that supplies primary gas supplied from a processing gas source into said processing chamber, and

a circulating gas supply system that supplies at least a portion of the exhaust gas into said processing chamber with said primary gas supply system and said circulating gas supply system constituted as systems independent of each other, and

wherein the total hole area of the primary gas supply holes is less than the total hole area of the circulating gas supply holes [supply quantity of the circulating gas is greater than the supply quantity of the primary gas].

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